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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
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10/531,634

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Jae-Ho Jung

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03/18/2009

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EXAMINER

MALEK, LEILA

ART UNIT

PAPER NUMBER

2611

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PAPER

**Please find below and/or attached an Office communication concerning this application or proceeding.**

The time period for reply, if any, is set in the attached communication.

<b>Office Action Summary</b>	<b>Application No.</b> 10/531,634	<b>Applicant(s)</b> JUNG ET AL.	
	<b>Examiner</b> LEILA MALEK	<b>Art Unit</b> 2611	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

### Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

### Status

- 1) ☒ Responsive to communication(s) filed on 02 January 2009.
- 2a) ☐ This action is **FINAL**.                      2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

### Disposition of Claims

- 4) ☒ Claim(s) 1,2,4-7,9 and 10 is/are pending in the application.
- 4a) Of the above claim(s) \_\_\_\_\_ is/are withdrawn from consideration.
- 5) ☐ Claim(s) \_\_\_\_\_ is/are allowed.
- 6) ☒ Claim(s) 1,2,4-7,9 and 10 is/are rejected.
- 7) ☐ Claim(s) \_\_\_\_\_ is/are objected to.
- 8) ☐ Claim(s) \_\_\_\_\_ are subject to restriction and/or election requirement.

### Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☒ The drawing(s) filed on 02 January 2009 is/are: a) ☒ accepted or b) ☐ objected to by the Examiner.  
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).  
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

### Priority under 35 U.S.C. § 119

- 12) ☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☒ All    b) ☐ Some \*    c) ☐ None of:
1. ☒ Certified copies of the priority documents have been received.
2. ☐ Certified copies of the priority documents have been received in Application No. \_\_\_\_\_.
3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

\* See the attached detailed Office action for a list of the certified copies not received.

### Attachment(s)

- |  |   |
|--|---|
| 1) <input type="checkbox"/> Notice of References Cited (PTO-892)                     | 4) <input type="checkbox"/> Interview Summary (PTO-413)           |
| 2) <input type="checkbox"/> Notice of Draftsperson's Patent Drawing Review (PTO-948) | Paper No(s)/Mail Date. _____                                      |
| 3) <input type="checkbox"/> Information Disclosure Statement(s) (PTO/SB/08)          | 5) <input type="checkbox"/> Notice of Informal Patent Application |
| Paper No(s)/Mail Date _____  | 6) <input type="checkbox"/> Other: _____                          |

## **DETAILED ACTION**

### ***Response to Amendment***

1. This office action is in response to the amendments received on 01/02/2009.

### ***Claim Objections***

2. Claim 4 is objected to because of the following informalities: the dependency of claim 4 needs to be changed from claim 1, to claim 2, because the error compensation coefficients have been introduced by the Applicant in claim 2. Appropriate correction is required.

### ***Claim Rejections - 35 USC § 112***

The following is a quotation of the first paragraph of 35 U.S.C. 112:

The specification shall contain a written description of the invention, and of the manner and process of making and using it, in such full, clear, concise, and exact terms as to enable any person skilled in the art to which it pertains, or with which it is most nearly connected, to make and use the same and shall set forth the best mode contemplated by the inventor of carrying out his invention.

3. Claim 6, 7, 9, and 10 are rejected under 35 U.S.C. 112, first paragraph, as failing to comply with the enablement requirement. The claim(s) contains subject matter which was not described in the specification in such a way as to enable one skilled in the art to which it pertains, or with which it is most nearly connected, to make and/or use the invention. As to claim 6, Applicant in step d-2-I) discloses receiving the error compensated data from the step d), comparing the error compensated data (according to step d error compensated data is the frequency down-converted signal) and the frequency down compensated signal and extracting the non-linear coefficient. Therefore, from steps d and d-2-I it appears that a signal (i.e. the frequency down-converted signal) has been

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compared to itself to find the coefficients. However, in the drawings and specification Applicant shows comparing the frequency down-converted signal with the error compensated signal to generate non-linear coefficients (see Fig. 2, blocks 318, 306, and 304). Therefore, Applicant in claim 6 fails to disclose how the non-linear coefficients have been generated in a way to enable one skilled in the art to use the same method.

***Claim Rejections - 35 USC § 103***

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

4. Claims 1, 2, 4, and 5 are rejected under 35 U.S.C. 103(a) as being unpatentable over background of invention further in view of Jin et al. (hereafter, referred as Jin) (US 6,449,466).

As to claim 1, Applicants in the background of invention disclose an adaptive array antenna system (see Fig. 1), comprising: modulation means 101 having a plurality of modulators for generating transmitting data corresponding to the number of users (see page 6, lines 36-37 - page 7, line 1); beam forming means 102 (see page 7, line 1-4) having a plurality of beam formers for generating a multiplexed data by multiplexing the generated transmitting data to a beam forming weight; vector addition means 103 for generating sum data by adding outputs of the beam forming means corresponding to a user (see page 7,

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lines 5-8); array error compensation means 108 for generating error compensated data by multiplexing a reverse of a transfer function of an array transmitting means to the sum data from the vector addition means 103 (see page 7, lines 8-10) by using a compensation signal inputted through a frequency down conversion means 114; compensation signal extraction means 113 for extracting a compensation signal from an output signal of the array transmitting means 110 and outputting the compensation signal; frequency down-conversion means 114 for generating a converted signal by frequency-down converting the compensation signal; array transmitting means 110 for converting the signal from the array error compensation means to an analogue signal and frequency-up converting the analogue signal (see page 7, lines 10-13); and array antenna 115 for transmitting an output signal passed through the compensation signal extraction means 113. Applicants in the background of invention disclose all the subject matters claimed in claim 1, except for array linearization means for receiving the error compensated data from the array error compensation means, generating linearized signal by linearizing the error compensated data by using the compensating signal from the frequency down conversion means and transferring the linearized signal to the array transmitting means, wherein the array linearization means includes non-linear coefficient extraction means for receiving an output signal of the array error compensation means, comparing the output signal and the compensating signal from the frequency down conversion means and extracting the non-linear coefficient, and pre-distortion means for linearizing the error compensated signal from the array error compensation

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means by multiplexing the extracted non-linear coefficient to the array error compensated signal. Jin, in the same field of endeavor, discloses an array antenna system (see Fig. 3), comprising: an array linearization means (see blocks 355 and 305 in Fig. 3) for receiving an input data signal and generating linearized signal by linearizing the data signal by using a compensating signal from the frequency down conversion means 335 and transferring the linearized signal to the array transmitting means 255 (see column 7). Jin further discloses that the array linearization means includes non-linear coefficient extraction means (see block 355) for receiving an output data from block 345, comparing the output data signal and the compensating signal from the frequency down conversion means and extracting the non-linear coefficient (see column 7, lines 33-42, wherein the pre-distortion error correction value has been interpreted as non-linear coefficient), and pre-distortion means (see block 305) for linearizing the error compensated signal from the array error compensation means (see column 8, lines 3-9) by multiplexing the extracted non-linear coefficient to the input data signal. It would have been obvious to one of ordinary skill in the art at the time of invention to modify Applicants' background of invention as suggested by Jin to correct the amplification distortion caused by the RF power amplifier in the transmit path (see column 2, lines 21-23). Jin does not expressly disclose that the array linearization means receives the error compensated signal; however since the purpose of using a pre-distorter in transmitter is only to correct the amplification distortion caused by the RF power amplifier, the position of pre-distorter at the transmitter is a matter of design choice. Therefore, it would have

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been obvious to one of ordinary skill in the art at the time of invention to combine the teachings of Applicants in the background of invention with Jin's teachings and place the pre-distorter for instance after the array error compensator to meet the design requirements of the system.

As to claim 2, Applicants in the background of invention further disclose that the array error compensation means 108 includes: error compensation signal generation means 104 for generating a digital error compensation signal to be injected to a channel in order to estimate the transfer function of the array transmitting means; error compensation signal injection 105 for generating digital transmitting data by adding an output vector of the vector addition means 103 and a vector of the digital error compensation signal vector; error compensation coefficient estimation means 106 for estimating an error compensation coefficient of each channel by considering relation between the compensation signal from the frequency down conversion means 114 and the error compensation signal generated from the error compensation signal generation means 104; and error compensation means 107 for multiplexing a reverse of the error compensation coefficient to the digital transmitting data (see page 7, lines 8-10) generated from the error compensation signal injection means 105 in each transmitting channel of the array transmitting means 110 and transferring a result of the multiplexing to the array transmitter means.

As to claim 4, Applicant in the background of invention discloses that the error compensation coefficient is a transfer function of the array transmitting means (see page 7, lines 32-33).

As to claim 5, the combination of Applicant's background of invention and Jin does not disclose updating period of error compensation coefficient is faster than an updating period of the nonlinear coefficients. However, it is a matter of design choice and therefore, it would have been obvious to one of ordinary skill in the art at the time of invention to update one set of coefficients more often than the other set to meet the requirements and conditions of the communication system.

### ***Conclusion***

Any inquiry concerning this communication or earlier communications from the examiner should be directed to LEILA MALEK whose telephone number is (571)272-8731. The examiner can normally be reached on 9AM-5:30PM.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Mohammad Ghayour can be reached on 571-272-3021. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.



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Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

Leila Malek  
Examiner  
Art Unit 2611

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